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THE MARKET FOR LUCA PACIOLI'S *SUMMA DE ARITHMETICA*: SOME COMMENTS

Abstract: This paper explains why Pacioli's exposition of double-entry bookkeeping, published in his *Summa* of 1494, was neither an effective reference text for merchants nor a satisfactory text for their sons. In doing so, the paper contradicts some of the points made in the interesting and wide-ranging article by Sangster, Stoner, and McCarthy in the June 2008 issue of this journal.

INTRODUCTION

In a recent paper [Yamey, 2004, p. 144], I noted that there is no evidence as to how many merchants bought copies of Luca Pacioli's *Summa de arithmetica* when it was published in Venice in 1494. I suggested, however, that it is unlikely that merchants, even Italian merchants, were major purchasers of the *Summa*. In a more recent article, A. Sangster, G.N. Stoner, and P. McCarthy (henceforth "Sangster et al.") conclude that Pacioli's *Summa* "was intended primarily as a reference text for merchants and as a school text for their sons, and that the large majority of sales of the book were to the mercantile classes" [Sangster et al., 2008, p. 131].

Sangster et al. make specific claims for the section *De computis et scripturis* (henceforth *De scripturis*) included in the *Summa*. Thus, they state that the "bookkeeping treatise would have been invaluable to many merchants" in various ways [Sangster et al., 2008, pp. 128-129]. These claims rest on the assumption that *De scripturis* was an effective exposition of the double-entry method and guide to its practice in Venice.

It is not intended here to examine the contention that the *Summa* was bought predominantly by merchants when it was first published, though I am not persuaded by Sangster et al.'s interesting and wide-ranging article. My commentary on that article is, instead, focused on explaining why the *De scripturis*, the pioneering printed exposition of double-entry bookkeeping

(DEB), was seriously inadequate and defective and could not have served in the various ways claimed for it in Sangster et al. A merchant who bought the *Summa* primarily for its pages on bookkeeping and accounts was likely to have been disappointed, frustrated, and perplexed.¹

DETERMINING ACCOUNTS TO BE DEBITED AND CREDITED

According to Domenico Manzoni, author of *Quaderno doppio...*, the whole difficulty of the art of DEB is to know how to discern in each transaction which account is to be debited and which to be credited (... *tutta la difficoltà de l'arte, in saper discernere in ciascuna facenda, qual sia esso debitore, e creditore...*) [Manzoni, 1540, ch. 11]. Statements to this effect appear in other publications. Thus, Roger North [1714, pp. 13, 46] wrote: "The making true *Drs.* and *Crs.* is the greatest Difficulty of Accounting, and perpetually exerciseth the Judgment....Some Cases will happen so perplexed, that it shall be the hardest thing in the World to find out, how to enter them, without transgressing Right and Truth...." In Malachy Postelthwayt's *Universal Dictionary of Trade and Commerce*, first published in 1751, we learn that in making entries in the journal "lies all the difficulty of accounting" because it is in the journal that "the debit and credit are rationally fixed and settled, according to the principles of accountantship" [Postelthwayt, 1751, art. "Mercantile Accountantship"]. And Edmund Degrange [1804, p. 7] stated that the only difficulty presented by the keeping of books by double entry is to find the debtor and creditor in each of the entries that must be made in the journal (*La seule difficulté qu'offre la tenue des livres en double partie, consiste donc uniquement à trouver le débiteur et le créancier des articles que l'on doit passer au journal.*)²

Manzoni sought to deal with that difficulty in two ways. One way was to present a rule or set of rules to guide the reader. The other way was to present a model set of account books in which were entered each of a large number of fictitious transactions,

¹ My comments are confined to *De scripturis*, which is only a small part of the large *Summa*.

² Jakob Marperger [1718, p. 14], an 18th century Swedish-German polymath, wrote that the whole of bookkeeping was founded on the intelligent or skilful distinguishing of debtor and creditor. He wrote that the journal was the battlefield or theater where a bookkeeper has to display what he has learned and understood. Marperger idiosyncratically used the term *Posten-Formir-Buch* (Entries Formation Book) for "journal."

including the entries to be made when the ledger was balanced and closed and its successor opened.

In his text, Manzoni gives a rule which, he writes, covers many of the kinds of transactions a merchant would encounter in practice. This rule is to debit the receiver or the thing received and to credit the giver or the thing given. This rule can be found, either plainly or with more elaboration, in many books on bookkeeping and accounts in the period up to 1800 (and also later).

Rules of this kind had their obvious limitations. To take a simple example, it would have been difficult to apply it to even such a simple matter as the granting of a rebate or abatement to a debtor who paid his debt before its due date. We can be sure that merchants, bookkeepers, and schoolboys were much better served by the model set of account books included as an integrated part of Manzoni's treatise than by Manzoni's rule and, indeed, by much of his written text.

Manzoni's model journal and ledger show the appropriate entries for 300 transactions (including the operations necessary for closing the ledger). The transactions, grouped by type, are listed. The 300 items are numbered and keyed to the numbered entries in the journal. Each item in the list also includes the folio numbers of the two ledger accounts to be debited and credited respectively. As Flavio Pilla [1974, p. 26] has observed, the bookkeeper, when in doubt, could reach for his *Manzoni* and readily enlighten himself as to how to transform a mercantile operation into one or more bookkeeping entries.

Pacioli's *De scripturis* does not include any general rule or rules purporting to guide the reader as to which account to debit and which to credit in a particular case. It does, of course, include in the body of the text many examples of how to treat specified transactions. But these are limited in range, and they are not shown as entries in a model set of account books reflecting a series of inter-related transactions. Moreover, there is no illustration of the entries necessary for closing a ledger and opening its successor. The text of the relevant chapter on that subject (chapter 34) is lengthy, but confused and confusing (as has been shown elsewhere).³ One cannot imagine the merchant or his bookkeeper reaching for his *Summa* (itself a heavy book) when

³For a detailed discussion, see Yamey [1994, pp. 160-165]. One source of puzzlement is Pacioli's *summa summarum*, dealt with towards the end of chapter 34. Viganó [1968, p. 45] has shown that the *summa summarum*, as described by Pacioli, could not serve any practical purpose. For a detailed discussion, see Yamey [1994, pp. 163-164].

uncertain as to how to proceed in dealing with an unfamiliar type of transaction or when embarking on the ledger-closing procedure.

Jan Ympyn, a Flemish merchant who had spent several years in Italy, included some material taken from Pacioli's *De scripturis* in his own treatise. This appeared in three versions, in Flemish (Dutch), French, and English respectively [Ympyn, 1543a, b, 1547].⁴ He included a model set of account books in the prologue to the English version, Ympyn [1547] wrote as follows (the wording has been modernized): "And to the intent that all persons might the more easily and sooner attain the knowledge of this said science, here shall follow in this treatise many and diverse examples, by the which every man may learn how to write and convey his business due and in like manner as the young maiden learns her works of the needle out of her exemplars."

Roger North [1714, pp. 10-11] expressed a similar point by telling the reader that he will "subjoin a fictitious Specimen, to render what is discours'd intelligible" – the "discourse" being a quite lengthy "general Scheme or Description of the Art of keeping Accompts by *Dr.* and *Cr.*"

Sangster et al. raise the question why Pacioli did not present a model set of account books as part of *De scripturis*. They suggest that Pacioli would have been able to provide one. In their view, he made a deliberate decision not to do so [Sangster et al., 2008, e.g., p. 130]. The reason was that paper and printing were expensive (especially if the material to be printed was complicated from the printer's point of view), and that brevity and avoidance of complexity were important. Redundant or inessential material should therefore be excluded. (Sangster et al. [2008, p. 126] rather undermine the emphasis they place on space-saving and cost-saving by noting that "large books were considered to be 'important books' during the Renaissance, irrespective of their content ...Simply having a book of this size [the *Summa*] in a personal library would impress anyone who saw it.") .

It is obviously risky to ascribe a particular motive or line of reasoning to an author on a matter on which that author did not declare himself at all. It is true that Pacioli did explain that in some places he gave only a few examples where he could have given more, and that he did this because the reader needed no

⁴Unlike Manzoni, who also used much of Pacioli's text, Ympyn acknowledged his debt to Pacioli.

further help and he, Pacioli, did not want his treatise to be too long. But those remarks made by Pacioli refer to the avoidance of unnecessary repetition;⁵ they cannot be applied to provide the reason for the omission of an illustrative set of account books of the kind provided by Manzoni in his text of 1540 and by many authors in several languages in the 400 years after his publication. Had Pacioli, or his publisher, been swayed by considerations of length and cost, his decision was a serious error of judgment. The lack of a model set of account books – combined with the seriously confusing and internally inconsistent chapter 34 – rendered *De scripturis* unfit for the purposes claimed for it by Sangster et al.

In the present context, it should be noted that *De scripturis* does include an un-numbered section which appears after the last numbered chapter (chapter 36). The unnumbered section, which is not listed in the table of contents of *De scripturis*, is headed “*Casi che apertiene amettere al libro de mercanti*” (which is perhaps best translated loosely as “events (or cases) to be entered in the ledger”). This heading in fact gives no indication of what is in the section. None of the numbered chapters of the text refers to the section in question; and, in turn, the section does not refer the reader to any of the numbered chapters.

The section informs the reader which accounts are to be debited and credited in each of a number of categories of transaction. This would undoubtedly have been helpful to a reader who consulted it (as has been explained above). However, what would have been a useful, though limited, guide is rather spoiled by a presentation that is not reader-friendly and is long-winded in places. In all, the apparently free-standing section, the existence of which is not sign-posted in the main text, is a bit of a puzzle – a part of a more significant puzzle (discussed in the penultimate section below).

IMPORTANT OMISSIONS FROM THE *SUMMA*

According to Sangster et al., the *Summa* was intended primarily as a reference text for merchants and as a school text for

⁵Sangster et al. [2008, p. 114] refer to a passage in *De scripturis* in which Pacioli is said to have written the following: “For if we wanted to give you an example of all the ways in which merchants do business...this would make our treatise very long...”. However, this quotation is misleading. Pacioli’s text makes it clear that he was referring to differences in the weights and measures and the names for commodities customarily used in different trading centers. He was not referring to differences in types of business transaction or to different bookkeeping treatments of particular transactions.

their sons. It is by no means obvious that an exposition directed at experienced merchants would also serve as an introductory basic text for inexperienced young beginners. As already explained, my view is that *De scripturis*, at least, could not have served either purpose effectively.

Additionally, however, *De scripturis* can be criticized as a reference text for *merchants* because it does not include any mention, let alone discussion, of topics on which even some experienced merchants might have welcomed guidance or reassurance. Excluded topics include collective (or compound) journal entries; closing and reversed opening balance accounts; inter-locking ledgers (such as a general ledger and a secret or private ledger); so-called *nostro* and *vostro* accounts; and the double index to the ledger.⁶ Further, only simple transactions involving bills of exchange are considered (in chapter 24). Again, there is no mention of the treatment of doubtful debts, or of the closing balance to be placed on a merchandise account (for the remaining unsold stock), or the account of a fixed asset such as a ship, furniture and fittings, or implements. (The late Raymond de Roover [1944, p. 398] drew attention to various features of accounting to be found in practice in 15th century Italy which are not mentioned in Pacioli's *De scripturis*. He attributed their absence to the fact, as he believed it to be, that Pacioli's *Summa* "simply incorporated...a handbook on bookkeeping which was used by beginners in the Venetian schools....Such a work could hardly be expected to attempt complicated problems which beginners would be unable to grasp.")

⁶The heading of chapter 13 of *De scripturis* announces that the chapter deals, *inter alia*, with the index (alphabet) to the ledger, "single and double." In fact, the only mention of the double index consists of four words of an obviously uncompleted sentence: "*E del dopio alfabeto.*" ("And of the double index.") Ympyn [1543a, b] provided the double index to the ledger in his model set of account books. For further details on the double index, see Yamey [1994, pp. 121-122].

There is another uncompleted sentence in *De scripturis*. Chapter 26 deals, *inter alia*, with the accounts to be kept in the merchant's ledger when he sends an agent on a voyage to trade with the merchandise he has entrusted to him. The chapter explains what is to be done when the agent returns and settles with the merchant. The chapter – and the page – ends with the words: "*E sei tuo commesso fosse i[n] le bande.*" The reader is left in the dark as to how the merchant should proceed in his accounts when his agent is "in fetters," presumably that is, when he fails to return because he has been taken captive or imprisoned. The intriguing question of the appropriate accounting treatment of the agent's misfortune is left in the air – possibly because several lines of type had been mislaid or had not been set. Whatever the reason for the error, the proof reader failed to notice the lacuna in the text.

CONFUSIONS WITH JOURNAL ENTRIES

Pacioli wrote that he would discuss *el modo di Vinegia* in *De scripturis*.⁷ He did not indicate which particular features distinguished the practice of bookkeeping and accounts in Venice from that in Florence, Milan, or elsewhere in Italy. In fact, while there were differences, for example, in the form of journal and ledger entries, there do not seem to have been more significant differences; for example, differences in treatment that would affect the balance on a profit-or-loss account of the firm.

In *De scripturis*, Pacioli identifies only one specific feature which he explicitly associated with Venice. It is the form or style of journal entry. However, the discussion and illustrative material in the relevant chapters 11 and 12 (dealing with the journal) would have puzzled and frustrated a reader who was not already familiar with the form of the journal entry in the Venetian style.

The “Venetian” form was as follows. Take the case of the entry for the receipt of cash of 100 ducats from a debtor Antonio Bassano. The entry would be:

Per Cassa // A Antonio Bassano
100 duc.

The term “Per” indicated the ledger account to be debited; the two slanting lines separated the debit and credit elements of the entry; and the “A” indicated the ledger account to be credited. (Manzoni and others explained that there were *two* slanting lines because in each case two ledger accounts were affected.) This style of entry can be seen in some surviving journals as well as in several treatises, including that of the Venetian Manzoni.

The treatment in *De scripturis* begins promisingly. The role of “Per” and “A” is explained correctly in chapter 11. But then what should be the two oblique lines (the *due virgolette*) are shown as two *vertical* lines. This itself is obviously of little moment. But a reader would have been puzzled to find that the specimen journal entries in the next chapter (chapter 12) have neither the incorrect vertical nor the correct oblique lines. Instead, the two elements of each entry are separated by colons. Translators of *De scripturis* have tended to be puzzled by all this.⁸

The first specimen journal entry in chapter 12 would have

⁷In 15th century Tuscany, *Vinegia* tended to be used instead of *Venezia*.

⁸The Venetian-style journal entry, its treatment in *De scripturis*, and the difficulties translators have had with it are discussed in detail in Yamey [1976, pp.156-161].

increased the reader's confusion or puzzlement. Its appearance is quite different from that of the specimens that immediately follow it. No explanation for this difference is given in chapter 12. Further, no reference is made to chapter 14 in which there is an explanation; namely, that the first specimen entry shown in chapter 12 purports to show how the entry would look *after* its content had been posted to [i.e., entered in] the two designated accounts in the ledger. But even then, the specimen does not accord with the description in chapter 14. Instead of two oblique cancellation lines being shown drawn across the body of the entry, the words *linea del die dare* (i.e., line of debit) are printed vertically on the left-hand side. (There is no corresponding line, for the credit, on the right-hand side.)

It is not known whether Pacioli, the proof reader, or the printer was responsible for the muddle and poor presentation. The present somewhat lengthy digression does, however, lead one to question the view expressed by Sangster et al. that *De scripturis* would have enabled a merchant to instruct his book-keeper how to switch to the "Venetian method" or, more generally, that it would have standardized the practice of DEB.

THE "TAILPIECE"

Sangster et al. [2008, p. 114] state that the inclusion of a set of model account books in *De scripturis* would have "considerably increased the complexity, and therefore the cost, of the typesetting and required many costly wood blocks to be carved or metal plates to be cast." They continue: "It is unlikely to have been an accident that the journal entries shown on the last page [of *De scripturis*] appear after all the text."

Sangster et al. are referring here to a short section that appears right at the end of *De scripturis* (henceforth referred to as the "tailpiece"). It is neither numbered nor listed in the table of contents to *De scripturis*. It is not referred to in any chapter of *De scripturis*, and it does not refer to any chapter.⁹ It seems to be detached from the rest of *De scripturis*. Moreover, the tailpiece does not show specimen *journal* entries. It consists of four

⁹In an earlier publication [Yamey, 1994, pp. 128-129], I wrote that Pacioli *did* refer to the tailpiece, in chapter 15 of the text. Near the beginning of that chapter, he drew the attention of the reader to the example of the ledger entry at the end (*e anco in fin di questo harai exemplo*). I interpreted *fin di questo* ("end of this") to mean end of *De scripturis*. *Exemplo* is singular; there are several "examples" in the tailpiece. The correct reading of *fin di questo* is "end of this chapter." Penndorf (1933, p. 111) has the correct reading.

ledger accounts in which entries are shown for five inter-related transactions. (The accounts would have stood out more clearly as accounts if the printer had left some space or had inserted a horizontal line after each of the accounts.)

What is relevant here is that the section and its location cannot have the significance Sangster et al. ascribe to them. Chapter 15 and several later chapters include several examples of entries in ledger accounts. Additional examples were unnecessary. Moreover, the examples did not involve complex typesetting or special type, and took up little space. This is also true of the specimen ledger accounts printed in the tailpiece.

What is more, the examples of ledger entries in the tailpiece are likely to have puzzled readers. This is so because the entries are different in style from those in the main text. The form and content of the tailpiece ledger entries are Tuscan, not Venetian. Neither the text nor the tailpiece draws attention to this fact. There is also no explanation why Tuscan-style entries are included in a treatise dealing purportedly with *el modo di Vinegia*.

Professor Esteban Hernández-Esteve [1994, pp. 77-80] has comprehensively analyzed the differences between the Venetian style of ledger entries (as in chapter 15) and the Tuscan style (as in the tailpiece). As his article is in a readily accessible journal, there is no need to cover the subject here. Hernández-Esteve concludes that the inclusion of the tailpiece supports his view that *De scripturis* is not a single, unified work but seems to consist of (at least) two distinct, discrete parts. I agree with his analysis and its conclusion.

CONCLUSION

The *De scripturis* is replete with puzzles and has many weaknesses. But this harsh-seeming assessment does not, of course, detract from the prominent place of Pacioli and *De scripturis* in the history of accounting or from the assured place of Pacioli and the *Summa* in the history of mathematics.

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